Measuring the Overlap of Particle Tracks' Traversing Sextants of the STT

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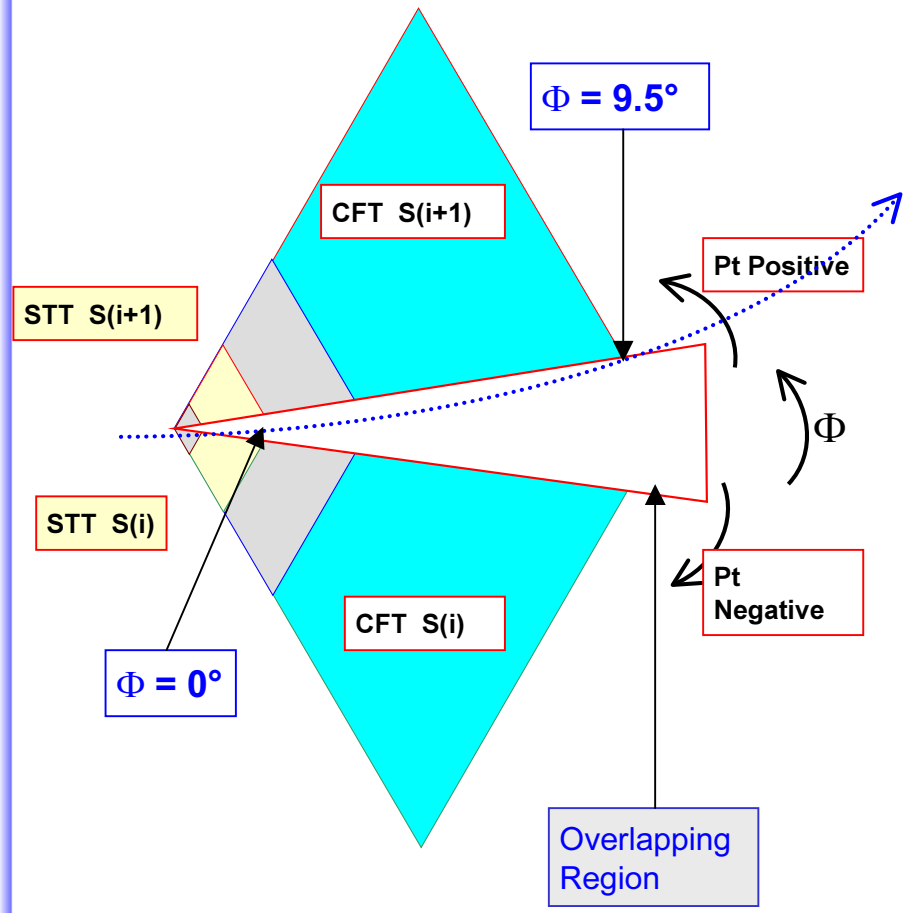
OUTLINE

- Motivation
- Geometry Considerations
- Results
- Conclusions/Questions

MOTIVATION

- Minimize the number of Duplicated Tracks
- Find how far (in degrees) a Track will ‘stray’ from one STT Sextant to another
- To know, given an H layer hit and the Track’s Pt to which Sextant(s) the Track should be sent

Need for Overlapping Regions in the STT/CFT



A track which:

- has a displaced vertex of ≈ 2mm
- has a Pt of +1.5GeV
- and passes through the Si strip

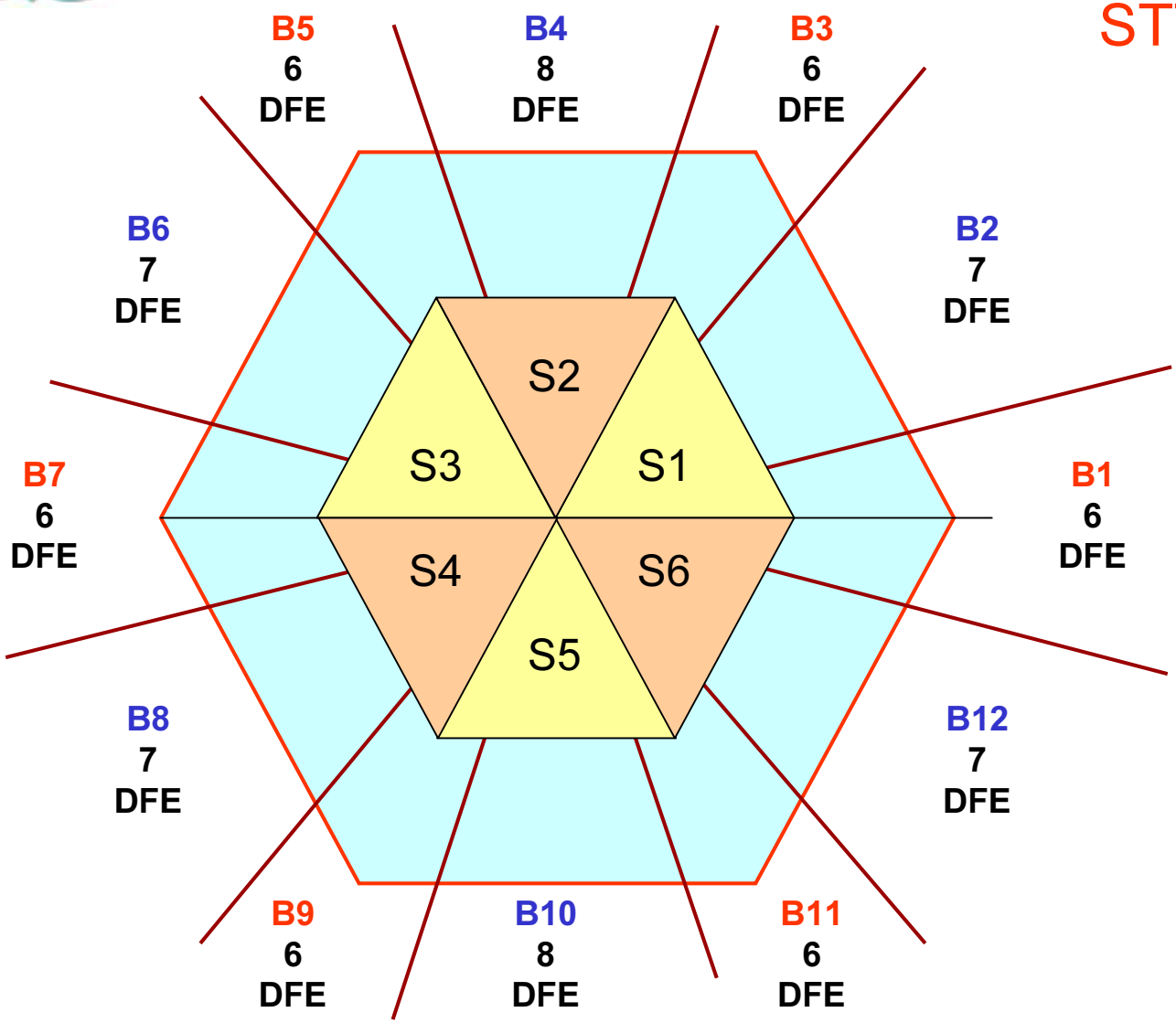
with higher Φ of the most outer layer of the Si Tracker (Φ=0 in the figure)

is fully contained in a Sextant S(i) of the Si Tracker

but

it is also fully contained in the Sextant S(i+1) of the Central Fiber Tracker passing through a fiber in the H layer with Φ≈ 9.5°

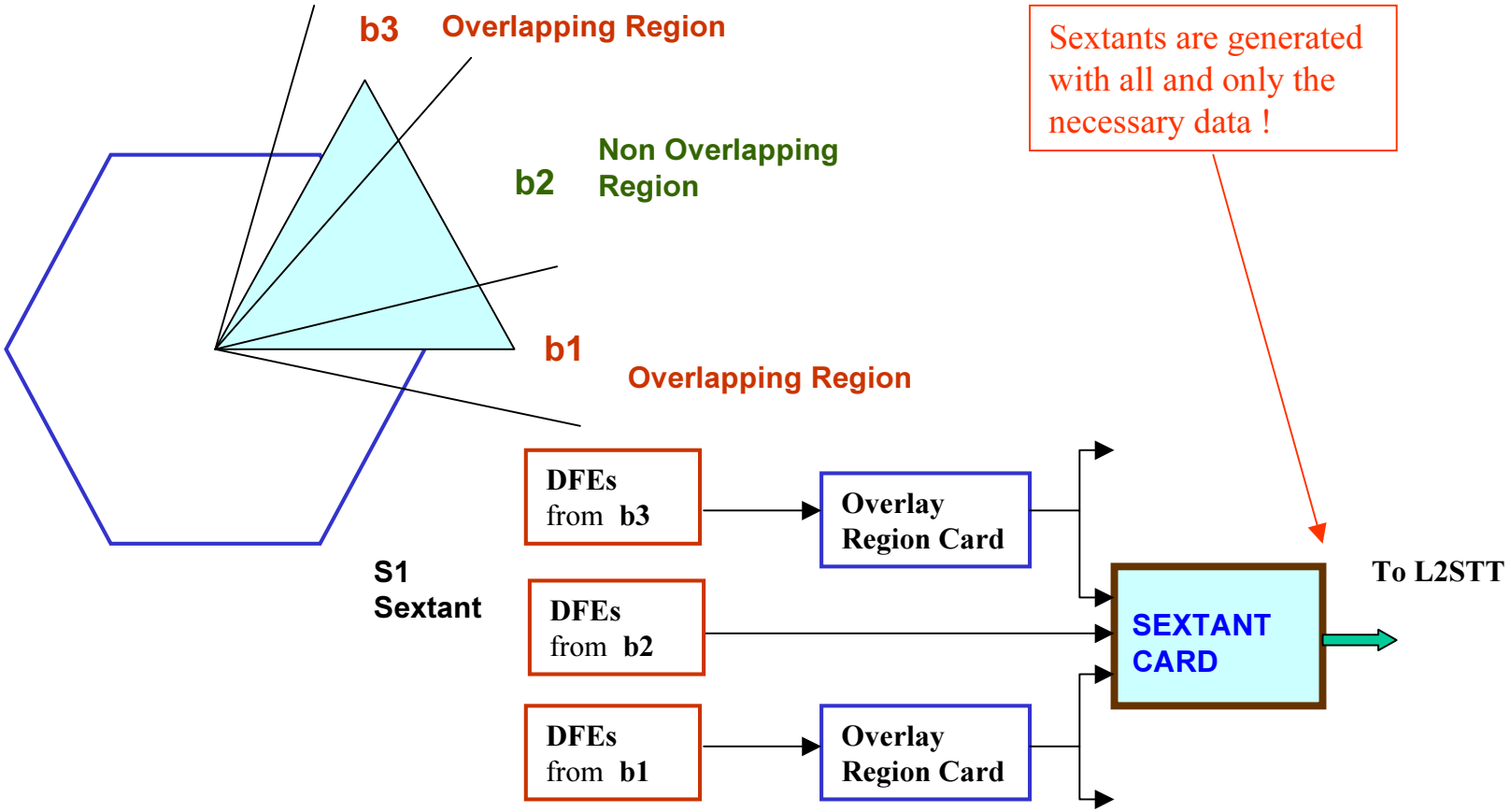
STT Topology



Odd regions are Overlapping Regions. Each has 6 DFE cards

Even regions are Non overlapping regions. They have eight or seven DFE Cards.

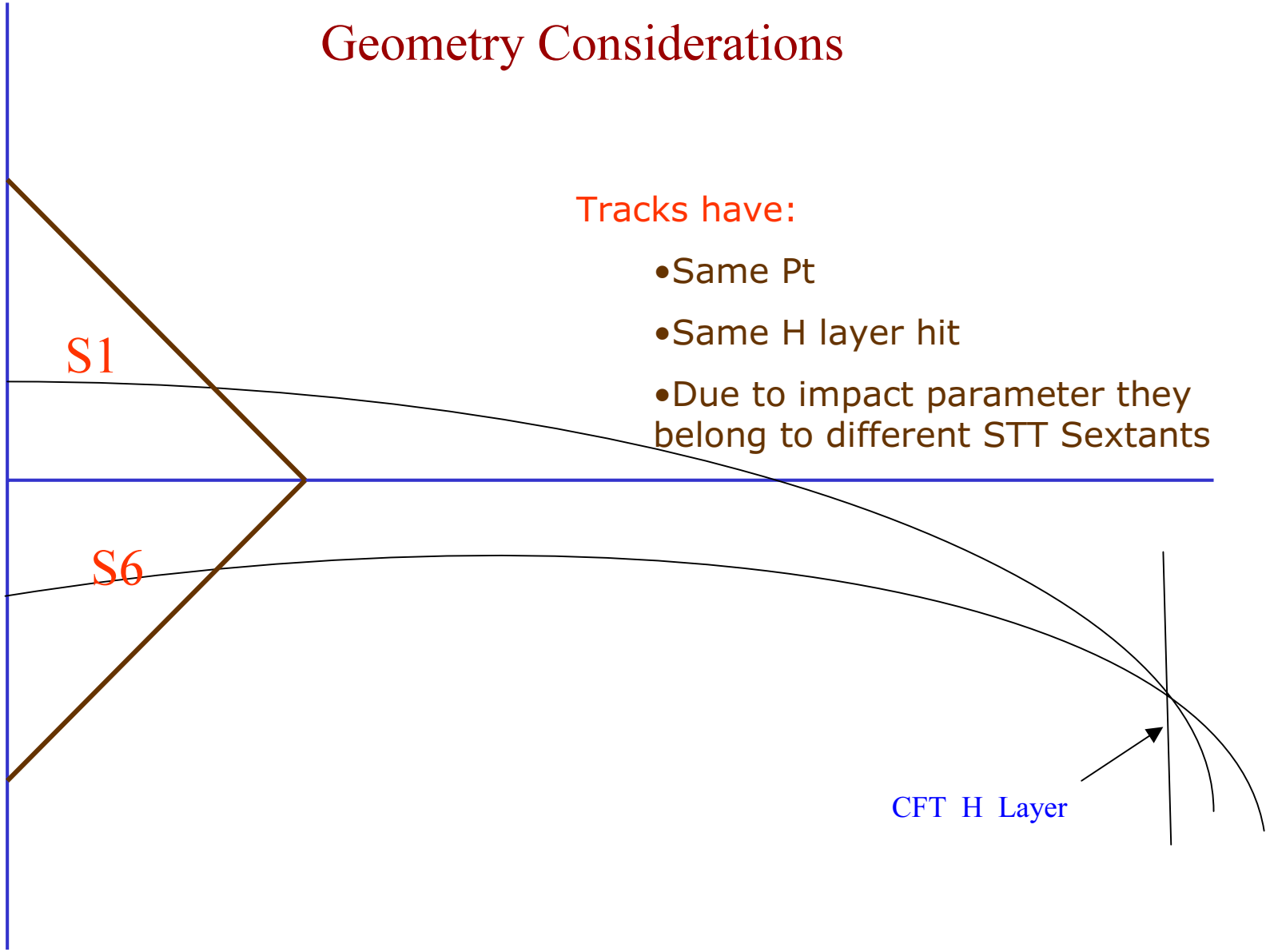
Organization of the STT data paths (only one Sextant shown)



Geometry Considerations

Tracks have:

- Same Pt
- Same H layer hit
- Due to impact parameter they belong to different STT Sextants



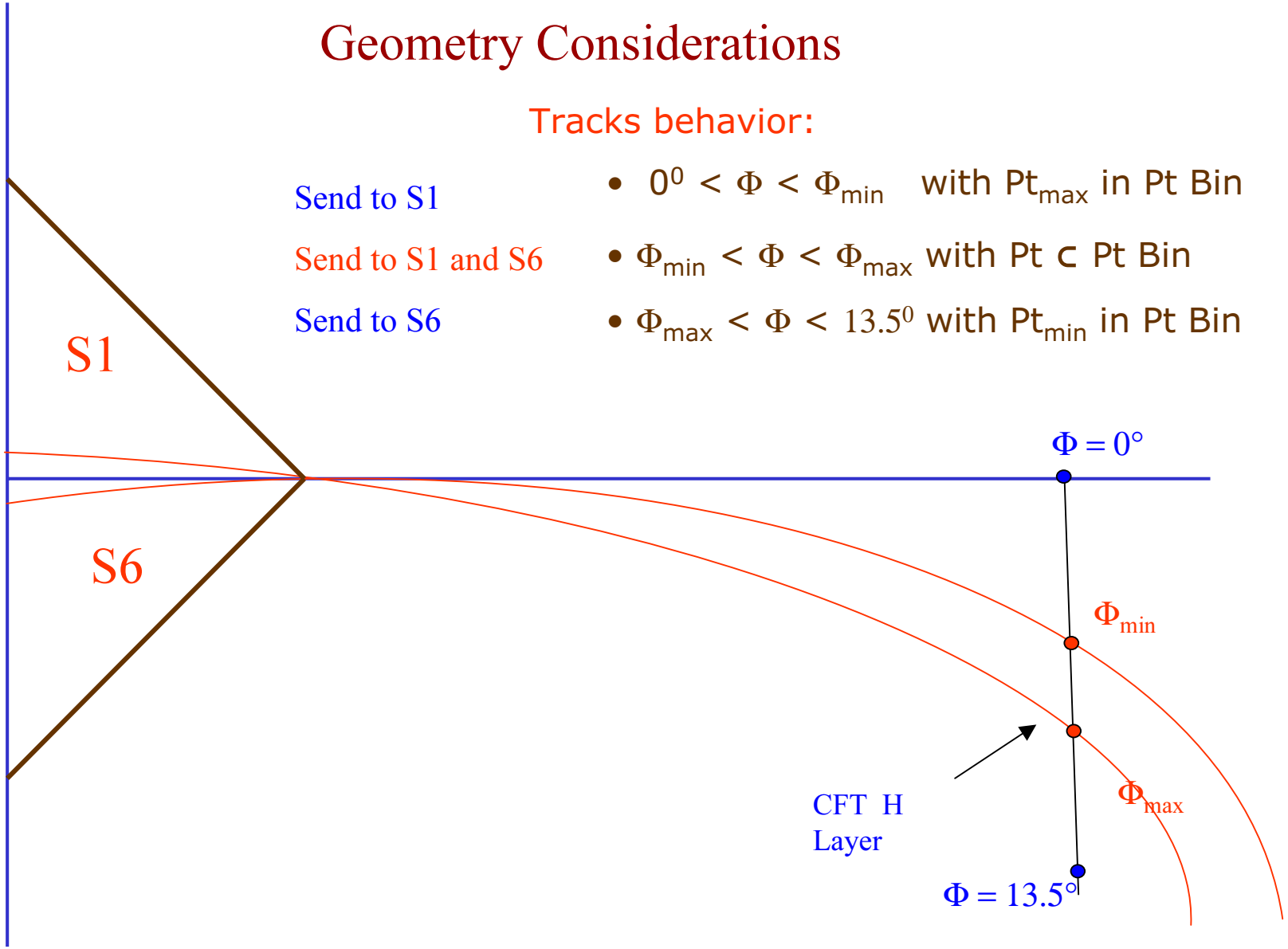
Geometry Considerations

Tracks behavior:

Send to S1
- $0^0 < \Phi < \Phi_{min}$ with Pt_{max} in Pt Bin

Send to S1 and S6
- $\Phi_{min} < \Phi < \Phi_{max}$ with Pt ⊂ Pt Bin

Send to S6
- $\Phi_{max} < \Phi < 13.5^0$ with Pt_{min} in Pt Bin



Tracks which are sent to two (2) Sextants (Duplicate Tracks)

Pt Bin	Φmin	Φmax	% of total Tracks
1.5 —— 3.0	1.20	9.59	13.9
3.0 —— 5.0	0	6.79	11.3
5.0 —— 10.0	0	5.67	9.45
10.0 —— ∞	0	4.83	8.05

NOTE
Calculations made assuming track belongs to the Si Sextant where the point [x,δ] with x ≡ min Si radius (2.72cm)

Tracks which are sent to two (2) Sextants (Duplicate Tracks)

Pt Bin	Φmin	Φmax	% of total Tracks
1.5 —— 3.0	1.45	5.670	7.0
3.0 —— 5.0	0.51	3.29	4.6
5.0 —— 10.0	0.21	2.34	3.55
10.0 —— ∞	0	1.63	2.7

NOTE
Calculations made assuming track belongs to the Si Sextant where the point [x,δ] with x ≡ max Si radius (10.05cm)

CONCLUSION / Questions

- The Overlapping Regions were found as function of Pt Bin and Φ
- The Percentage of Tracks that are sent to two Sextants was calculated as function of the Pt Bins
- How do you assign a Track to a STT Sextant?

Next Steps

- Recalculate Overlapping Regions with "correct" assignment of Tracks to Sextants if necessary
- Program the FPGAs for the Overlapping Regions and the Sextants in the Collector/Broadcaster